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How do they get here: Does the method of transportation impact salvage for patients with testicular torsion?

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Summary

Introduction
A growing number of patients are arriving at our tertiary care center for evaluation of possible testicular torsion using ambulance or helicopter transport. In many cases the parents arrive by car before the patient arrives. Are these advanced methods of medical transport worth the expense and risk in the case of suspected testicular torsion?

Objective
We evaluated the total number of patients presenting to our emergency room for suspected testicular torsion to see if the means of transport affected testicular survival.

Study design
Retrospective.

Results
As shown below in the table, the means of transport did not impact on testicular salvage.

Discussion
It is understandable that many patients with scrotal pain seek treatment closer to home because of their pediatrician's recommendation and/or family preference. However once evaluated many patients are transferred because of a lack of urologists willing to evaluate and treat the pediatric patients in community settings or because of a lack of anesthesia support. These patients are often transported by ambulance or helicopter. Our data would suggest that there is no improvement in the testicular salvage rate seen with these more advanced means of medical transportation compared with transfer by private car even when we restrict the analysis to patients traveling from over 40 miles away. We suspect that important time is lost while waiting to make such transfer arrangements. Furthermore transfer by ambulance or helicopter is more expensive and these costs are often passed on to families. Transfer by helicopter is also riskier. While an argument can be made in favor of medical transport over long distances or long driving times, this data suggests that many of these transfers could be accomplished by car with no effect on testicular salvage rates.

Conclusion
The rate of testicular salvage was not affected by the means of transport to our tertiary facility. Only 4 patients would have required advanced of medical transport if this were limited to those facilities over 100 miles or 1.5 hours driving time away. This would achieve a substantial cost savings with no measurable change in outcome.

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Introduction

Testicular torsion is one of the few true urologic emergencies with a narrow window of opportunity for successful management. Prolonged ischemia lasting >6 h will increase the odds of testicular loss. Time is of the essence, and every aspect of the diagnosis and treatment should be streamlined. Bayne et al. previously established that any time delay to treatment, including distance from the hospital and delays associated with transfer, contribute to poorer outcomes for patients with testicular torsion [1]. While primary care physicians would like their patients to be evaluated locally, once a definitive diagnosis of testicular torsion is established in many community hospitals, there is often no access to surgical care. Many emergency departments (EDs) cannot call upon a fellowship-trained pediatric urologist or adult urologist who is willing to assume their care, and a growing number of these patients are being transferred to a tertiary care facility.

While it is well established that delay leads to a decline in salvage rate, the actual means of transfer transportation have not conclusively been linked to differences in outcomes for testicular torsion [2]. The means of transport is usually determined by the referring and receiving transport center facilities, and is often based upon location and seasonal traffic patterns. Options for interfacility transport include the use of an ambulance, helicopter or private car, but the last option is rarely used, due to liability concerns.

There is a large cost difference between ambulance and helicopter transport — both in dollars and in utilization of resources. It has been anecdotally noted many times that patients who were transported by helicopter had their family arriving nearly simultaneously in a private car; thus, the question of the benefits of air vs ground transport, not only with regard to cost, but also time delay and risk inherent in flying, has been raised. For all of these reasons, the present study sought to understand how patients undergoing surgical exploration for suspected testicular torsion arrived at the hospital. The purpose was to see if any changes in outcomes could be correlated with the mode of transportation. Since it has already been shown that delay in treatment affects outcomes, the study did not focus on time to presentation or time spent at the referring hospital, but rather attempted to gain a broad overview of outcomes from the different methods of transportation.

Materials and methods

Using an IRB approved data registry, retrospective review of operative records, the Transport Team database, and Emergency Department (ED) logs from 9/2005 through 12/2012 were cross referenced to identify all patients who presented for evaluation of an acute scrotum and underwent surgery for acute scrotal findings in the same time period. Patients who were transferred for incarcerated inguinal hernias or testicular trauma were excluded. The patients were categorized as arriving from home by car, or arriving from another hospital by ground ambulance or helicopter. In some cases, this data were abstracted from emergency room charts and intraoperative dictations that indicated mode of transport. Transport distances and estimated driving times were determined with Google Maps; home address towns were used as the origination points for car travel, and referring hospital addresses for ambulance or helicopter transports.

The primary outcome variable was dichotomized to: salvage or no salvage. Salvage was assessed not only based on intraoperative findings, but also upon the last available clinic note at the follow-up visit. The predictor variables that were examined were: method of transport (car, ambulance or helicopter). Exploration and testicular salvage rates were compared using Chi-squared testing. Driving distances and times were compared using an analysis of variance (ANOVA) with Newman-Keuls post hoc testing.

Results

A total of 632 patients presented to the ED for evaluation of scrotal pain during this time frame. For the 484 patients presenting to the ED by car, with a chief complaint of scrotal pain, 94 underwent scrotal exploration with an operative rate of 19.4%. The percentage of surgical explorations increased for patients arriving by ambulance: 37/111 (33.3%) ($P < 0.002$ vs car) or helicopter: 30/37 (81%) ($P < 0.001$ vs car and ambulance) (Fig. 1). Of the 161 patients undergoing emergent scrotal exploration during this time frame, 67 (41.6%) arrived by some form of medical transport; these patients actually showed a lower rate of testicular salvage: those arriving by ambulance 62% and those arriving by helicopter 63% vs those arriving at the ED directly by car 70%; however, this difference was not significant ($P = 0.60$). One boy in each transport category proved to have a torsed appendix testis, and one boy transported by air proved to have a rupture of the tunica albuginea due to trauma; these outliers did not affect the salvage rates. The average age across these three groups was examined, and showed a slight decline that was not significant (car 11.9 ± 5 years, ambulance 10 ± 6.6 years, and air 9.9 ± 5.9 years ($P = 0.01$ by ANOVA).

When examining distances traveled, patients transferred by ambulance or helicopter traveled across greater distances, with longer estimated automotive travel times. The average distance traveled by car was 15.7 ± 21.5 miles, with an estimated driving time of 0.6 ± 0.33 h, while those coming by ambulance traveled 29.5 ± 25.2 miles ($P < 0.001$ vs car), and those arriving by helicopter traveled an average of 58.4 ± 27.5 ($P < 0.001$ vs car, and $P < 0.01$ vs ambulance). The predicted driving times were 0.61 ± 0.38 h for the cohort transported by ambulance and 1.04 ± 0.42 h for the cohort transported by helicopter.

When patient treatment was further stratified by distance traveled to those coming from >40 miles away, it was found that the salvage rates of those who were explored were better in those traveling by ambulance than by air (81.8% vs 65.2%), while 54.5% of the 11 coming from >40 miles by car were salvaged, but again these differences were not statistically significant ($P = 0.39$) (Fig. 2).

Discussion

Testicular torsion is an emergency that can be readily fixed if the patient receives expeditious care. Tertiary care

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